embodiments discussed herein. Therefore, it is intended that this invention be limited only by the claims and the equivalents thereof.

What is claimed is:

1. A semiconductor device, comprising:

field electrode structures extending in a direction vertical to a first surface in a semiconductor body;

cell mesas formed from portions of the semiconductor body between the field electrode structures and including body zones forming first pn junctions with a drift zone;

gate structures formed between the field electrode structures and configured to control a current flow through the body zones; and

auxiliary diode structures with a forward voltage lower than the first pn junctions and electrically connected in parallel with the first pn junctions, wherein semiconducting portions of the auxiliary diode structures are formed in the cell mesas.

2. The semiconductor device of claim **1**, wherein the first pn junctions are configured to be conductive in a reverse-biased operational state of the semiconductor device.

3. The semiconductor device of claim **1**, wherein a first lateral extension of the field electrode structures along a first horizontal direction parallel to the first surface is at most three times as large as a second lateral extension of the field electrode structures along a second horizontal direction orthogonal to the first horizontal direction and parallel to the first surface.

4. The semiconductor device of claim **1**, wherein the auxiliary diode structures are Schottky contacts.

5. The semiconductor device of claim **4**, wherein the Schottky contacts are formed at interfaces between the drift zone and conductive structures, each conductive structure extending between one of the gate structures and one of the field electrode structures from the first surface into the semiconductor body.

6. The semiconductor device of claim **5**, wherein each conductive structure directly adjoins the corresponding field electrode structure.

7. The semiconductor device of claim **5**, wherein each field electrode structure comprises a field electrode and a field dielectric separating the field electrode from the semiconductor body, and each conductive structure is sandwiched between one of the cell mesas and one of the field dielectrics.

8. The semiconductor device of claim **5**, wherein the conductive structures separate the field electrode structures from the first surface.

9. The semiconductor device of claim **5**, wherein the conductive structures are spaced from the field electrode structures and extend through the body zones.

10. The semiconductor device of claim **4**, wherein the gate structures are formed between the cell mesas and the field electrode structures and the Schottky contacts are formed between the cell mesas and the field electrode structures.

11. The semiconductor device of claim **10**, wherein the Schottky contacts are formed at interfaces between the drift zone and conductive structures, each conductive structure extending from the first surface into a field dielectric of one of the field electrode structures and directly adjoining the adjoining cell mesa.

12. The semiconductor device of claim **1**, wherein the auxiliary diode structures are MOS gated diodes with diode electrodes electrically connected to source zones forming second pn junctions with the body zones and diode dielectrics sandwiched between the diode electrodes and the body zones.

13. The semiconductor device of claim **12**, wherein a threshold voltage of the MOS gated diodes is lower than a threshold voltage of transistor cells controlled by the gate structures.

14. The semiconductor device of claim **12**, wherein the diode dielectrics are at least partially thinner than the gate dielectrics.

15. The semiconductor device of claim **12**, wherein a vertical extension of the MOS gated diodes with respect to the first surface is equal to or greater than a vertical extension of the gate structures.

16. The semiconductor device of claim **12**, wherein the gate structures are stripes, the field electrode structures are arranged in lines between the gate structures, and the MOS gated diodes are arranged between neighboring field electrode structures of the same line.

17. The semiconductor device of claim **16**, wherein each field electrode structure comprises a field electrode and a field dielectric separating the field electrode from the drift zone, and the field electrodes and diode electrodes form contiguous lines.

18. The semiconductor device of claim **16**, wherein the field electrode structures and the MOS gated diodes are spaced from each other.

19. The semiconductor device of claim **18**, wherein each field electrode structure comprises a field electrode and a field dielectric separating the field electrode and the drift zone, a connection portion of the field electrode directly adjoining neighboring source and body zones.

20. The semiconductor device of claim **12**, wherein the gate structures are stripes, the field electrode structures are arranged in lines between the gate structures, and the MOS gated diodes are arranged in the vertical projection of the field electrode structures between a plane coplanar with the first surface and the field electrode structures.

21. The semiconductor device of claim **20**, wherein the diode dielectrics completely separate the diode electrodes from the semiconductor body.

22. The semiconductor device of claim **20**, wherein the diode dielectrics separate the diode electrodes from the semiconductor body at a first side facing a first one of neighboring gate structures, and wherein at a second, opposite side facing a second one of neighboring gate structures, the diode electrodes form a direct interface with the source and body zones.

23. The semiconductor device of claim **22**, wherein a first distance between the MOS diode structure and the first one of neighboring gate structures is greater than a second distance between the MOS diode structure and the second one of neighboring gate structures.

24. The semiconductor device of claim **10**, wherein the gate structures are formed between the cell mesas and the field electrode structures and the MOS gated diodes are formed between the cell mesas and the field electrode structures.

25. The semiconductor device of claim **24**, wherein the gate structures and the MOS gated diodes extend from the first surface into field dielectrics of the field electrode structures.

26. An electronic assembly, comprising:

a semiconductor device comprising:

field electrode structures extending in a direction vertical to a first surface in a semiconductor body;